Earth Syst. Dynam. Discuss., 6, C780–C786, 2015
www.earth-syst-dynam-discuss.net/6/C780/2015/

Earth System Dynamics Discussions
Open Access

ESDD

6, C780–C786, 2015

Interactive Comment

Interactive comment on "How different sources of climate databases influence assessment of growth response in dendroclimatic analyses – case study from Lapland" *by* R. Sitko et al.

R. Sitko et al.

vido@tuzvo.sk

Received and published: 12 November 2015

Reply to General comments of Referee#1:

Comment: Modelled, measured data?

Reply: In aim to be clear what is meant with "modelled" and "measured" data, we decided to enlarge used terminology with term "observed" data, i.e. modelled = gridded meteorological data, observed = recorded data from meteorological stations, measured = radial increments data (synchronized dendrochronologies). Terminology will be built-in to revised manuscript.

Comment: One gridded data set?

Reply: We evaluated three gridded databases mostly used in dendroclimatic analyses: 1) CRU TS 3.21 - monthly temperature and precipitation data; 2) Luterbacher et al. (2004) – seasonal temperature data; 3) Pauling et al. (2006) – seasonal precipitation data. We agree it would be more comprehensive to incorporate any other gridded databases. It allows us to present more general conclusions. We decided to add two more gridded databases and to prepare aggregated CRU data sets for seasonal precipitation and temperature: 4) GISS – anomalies of monthly average temperature, 5) GPCC – precipitation monthly totals, 6) CRUagr - aggregated CRU database for seasonal precipitation and temperature. EOBS, CPC, GPCP databases, mentioned in discussion, include too short time series for a lot of dendroclimatic applications. Finally we evaluate six modelled databases with 8 gridded data sets and NORDKLIM database with 9 data sets of observed climatic data. Properties and used labels for all evaluated climatic data sets are mentioned in Supplement (Tab. 1)

Comment: Using SPEI?

Reply: Some specialized dendroclimatic application can analyze relation increment vs. SPEI, but they mostly analyze temperature and precipitation influence to increment separately (Babst et al. 2013, Rybníček et al., 2010, Büntgen et al., 2007). The reason is that one of them is more limiting factor depending on latitude or altitude, tree species and so on. A lot of applications analyzing growing response of trees are connected to climate change models to predict yields in the future. Our work considers mostly methodological aspect of using various sources of climatic data in dendroclimatic applications, so we suppose it is not necessary to analyze any other special climatic indices, especially when they are derived characteristics. We understand reviewer suggestion to use SPEI as a complex indicator of multiple effects of precipitation and temperature (evapotranspiration). However because of the variable temporal scale of the SPEI, there is a question of the appropriate time scale to be applied. We understand this as a research question more applicable in specific article dealing with correlation between e.g. tree rings and variable time scales of the SPEI (interesting idea – thanks for that). Therefore we see this suggestion very complicated to be applied in presented paper. In addition because of the specific climate in polar areas (humid climate feature – according to the Koppen-Geiger climate classification Dfc and relatively low air temperature) air temperature is the major driver of the ecological processes in the area. This is also confirmed by higher correlation coefficients for growing response to temperature as to precipitation in our results (Supplement Fig. 5 and Fig. 6). However we see that this should be expressed in explicit form in our manuscript. Therefore we decided to modify our manuscript by adding the section "Climate of the studied area" (Supplement: Fig. 2 and section "Climate of the studied area").

REFERENCES: Babst, F., Poulter, B., Trouet, V., Tan, K., Neuwirth, B., Wilson, R., Carrer, M., Grabner, M., Tegel, W., Levalic, T., Panayotov, M., Urbinaci, C., Bouriaud, O., Iais, P., and Frank, D.: Site and species-speciïňĄc responses of forest growth to climate across to European continent,10 Global Ecol. Biogeogr., 22, 706–717, 2013 Büntgen, U., Esper, J., Verstege, A., Nievergelt, D., Frank, D. C., and Wilson, R. J. S.: Growth responses to climate in a multi-species tree-ring network in Western Carpathian Tatra Mountains, Poland and Slovakia, Tree Physiol., 27, 689–702, 2007 Rybníček, M., Čermák P., Žid, T., Kolář, T.: Radial growth and healthy condition of Norway Spruce (Picea abies (L.) KARST.) stands in relation to climate (Silesian Beskids, Czech Republic), Gochronometria, 36, 9-16, 2010

Comment: Conclusions and suggestions?

Reply: Conclusions and our suggestions related to our enhanced results (Supplement – Tab. 2 and Tab. 3, Fig. 2 a, b, Fig. 3 a, b, Fig. 4 a, b, Fig. 5 a, b, Fig 6 a, b) will be built-in to revised manuscript.

Comment: Reference data?

Reply: As a reference data for the main aim of our study we use tree rings data. We agree, it could be sometimes unclear what the reference data are. For example, at the chapter 3.1 “Evaluation of errors in modelled climate databases” we do not use any tree ring data. The reference data for this chapter are observed climatic data in aim to compare modelled and observed databases. We will rename chapter 3.1 as “Comparison of climate databases” and some other formulations will be built-in to revised manuscript to clear it.

Reply to Specific comments:

Reply to comment at 1537/16 – We accept it and it will be built-in to revised manuscript.

Reply to comment at 1538/5 – Difference in term “meteorological” and “precipitation” station is in the sense of observed meteorological features. All basic meteorological features (temperature, precipitation, . . .) are observed at the meteorological station. At the precipitation station were observed just precipitation quantities. The shorter distance of precipitation station Tjamotis (18 km) into the plot of wood cores collection (Haras) was the reason why we decided to use this station for precipitation analyses instead of meteorological station Kvikkjokk located 40 km far away. So the idea was to choose the both meteorological features as close as possible to Haras plot and therefore we demonstrated typical approach at the dendroclimatic analyses.

Reply to comment at 1538/9ff – No, we have not taken the lapse rate into account. We believe that it is unnecessary for the comparison of gridded and observed databases (chapter 3.1), because of different scale of climatic information. Observed climatic data represent point information and gridded data represent average value for one cell of grid (0.5°x 0.5°). It will be explained in revised manuscript. In case of growing response analyses (chapter 3.2), the correlation analysis was used. It assesses the amount of explained variance of related variables, so it is not necessary to take into account the lapse rate which is representing the systematic bias of climatic data (in case of linear lapse rate, what is for temperature expected).

Reply to comment at 1539/11 – We agree, it will be built-in to revised manuscript.

ESDD

6, C780–C786, 2015

Interactive Comment

Reply to comment at 1539/26 – Dendroclimatic analyses usually utilize existing gridded seasonal databases such as Luterbacher et al. (2004) or Pauling et al. (2006), as we did. But for the methodological aim of our paper it would be interesting aggregate gridded monthly database CRU TS 3.21 and on the behalf of your recommendation we decided to append to our analyses the aggregated database mentioned above. It would lead for more comprehensive results and show the researchers alternative way of utilizing this database.

Reply to comment at 1541/3 – CRU are modelled, NORDKLIM is observed and tree rings are measured data. It will be corrected in context of Reply to General comments mentioned above.

Reply to comment at 1542 – No tree rings data were used at the first part of results (chapter 3.1). Just differences like bias and random error of used climate databases were evaluated. It will be highlighted in start of that chapter in revised manuscript.

Reply to comment at 1542/4f – The reference of the percentage standard error is average temperature. We agree that in case of average value 0°C it would be impossible to count percentage deviation, but we have no zero average. For most dendroclimatic applications in Europe, there is used °C as unit of temperature. We consider retaining °C as a sufficient representation of results for potential dendroclimatic researchers (readers). Generally, it seems to be fairly rare event to receive average value 0°C, mainly if it is counted with tenth or hundredth resolution.

Reply to comment at 1542/14f – We do not consider as an important to compare monthly and seasonal databases. Depending on aim of dendroclimatic analysis only one kind of them is selected. The important is comparison inside of group of used monthly or inside of seasonal data sets. We agree, this point of view is not clear from our conclusion and it will be mentioned in revised manuscript.

Reply to comment at 1543/6ff – Bias correction was not applied for analyses in chapter 3.2 for the same reason as it was mentioned in comment concerning to the lapse

ESDD

6, C780–C786, 2015

rate. Another one reason is the difference in scale of gridded and observed data sets. Explanation will be built-in to conclusion of revised manuscript.

Reply to comment at 1543/11ff – It will be improved in sense mentioned in Reply to

General comments (modelled, observed, measured data).

Reply to comment at 1543/21 – observed data were located within grid cell of gridded data for the purpose of comparison of climatic databases and model quality evaluation (chapter 3.1 and beginning of chapter 3.2). On the other hand, in growing response analyses (main part of chapter 3.2) gridded data were used in location of wood core collection plot (Haras), which was not at the same grid cell location as a meteostation. So, the locations of gridded and observed data were not overlapped in that part of chapter 3.2. The reason is that the main idea of dendroclimatic analysis is to correlate tree rings data (increment) with climatic data related to location of increment formation. It will be highlighted in revised manuscript.

Reply to comment at 1544/18 – annual increment was significantly negatively correlated with temperatures in Jun (not April) and August at the level 95% and in July at 99%. It will be built-in to revised manuscript.

Reply to comment at 1544/20 – We will refer it in revised manuscript.

Reply to comment at 1544/22 – Yes, it is 99 %. It will be corrected in revised manuscript.

Reply to comment at 1546/10ff – Yes, the value of grid cell is representative for whole cell. The conclusion to the comparison of climatic databases (chapter 3.1) will be corrected in aim to highlight different scale of climatic information receiving from observed and gridded datasets.

Reply to comment at 1547/3 – Theoretically, it is impossible to count relative anomaly if mean precipitation is equal to zero. But we believe that it is unreal for long-term monthly/seasonal average totals of precipitation to be equal zero at those latitudes.

ESDD

6, C780–C786, 2015

Reply to comment at 1547/22f – We concluded that precipitation is more variable in space than temperature based on analyses couple more meteorological stations surrounding the plot on Haras (up to 110 km). Finally those stations have been excluded from the presentation of results, but the conclusion left in our paper. We agree that this conclusion is unsubstantiated by our results and it will be corrected in revised paper by supplementing the results from surrounding meteorological stations. It will bring more complex results.

Reply to technical corrections: All technical corrections will be built-in to revised manuscript.

Thanks a lot for dedicated time for our manuscript, all challenging questions and recommendations. Authors

Please also note the supplement to this comment:
http://www.earth-syst-dynam-discuss.net/6/C780/2015/esdd-6-C780-2015-supplement.pdf

---

Interactive comment on Earth Syst. Dynam. Discuss., 6, 1535, 2015.